

## Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

Sub-Committee of Experts on the Transport of Dangerous Goods

10 December 2012

### Forty-second session

Geneva, 3 – 11 December 2012

Item 2 (c) of the provisional agenda

**Recommendations made by the Sub-Committee on its  
thirty-ninth, fortieth and forty-first sessions and pending issues:  
electric storage systems**

## Adsorbed Gas Classification and Packaging

**Transmitted by the Council on Safe Transportation of Hazardous  
Articles (COSTHA)**

### Proposal following the Lunchtime Working Group

1. Amend 2.2.1.2 to include a new transport condition of a gas as follows:

*“(e) Adsorbed Gas—a gas which when packaged for transport is adsorbed onto a solid porous material resulting in an internal receptacle pressure of less than 101.3 kPa at 20 °C and less than 300 kPa at 50 °C.”*

2. Add seventeen new entries (UN 3XXX, UN 3YYY, UN 3AAA, UN 3BBB, UN 3CCC, UN 3DDD, UN 3EEE, UN 3FFF, UN 3GGG, UN 3HHH, UN 3JJJ, UN 3KKK, UN 3LLL, UN 3MMM, UN 3NNN, UN 3PPP, UN 3RRR) in Class 2.

- (a) Add 17 new entries to the Dangerous Goods List, as follows:

UN No.	Name and description	Class or Division	Subsidiary risk	UN Packing group	Special provisions	Limited and excepted quantities		Packagings and IBC's		Portable tanks and bulk containers	
						(7a)	(7b)	Packaging instructions	Special packing provisions	Instructions	Special provisions
(1)	(2)	(3)	(4)	(5)	(6)	(7a)	(7b)	(8)	(9)	(10)	(11)
3XXX	ADSORBED GAS, FLAMMABLE, N.O.S.	2.1			274	0	E0	P2YY			
3YYY	ADSORBED GAS, N.O.S.	2.2			274	0	E0	P2YY			
3AAA	ADSORBED GAS, TOXIC, N.O.S.	2.3			274	0	E0	P2YY			
3BBB	ADSORBED GAS, OXIDIZING, N.O.S.	2.2	5.1		274	0	E0	P2YY			
3CCC	ADSORBED GAS, TOXIC, FLAMMABLE, N.O.S.	2.3	2.1		274	0	E0	P2YY			
3DDD	ADSORBED GAS, TOXIC, OXIDIZING, N.O.S.	2.3	5.1		274	0	E0	P2YY			
3EEE	ADSORBED GAS, TOXIC, CORROSIVE, N.O.S.	2.3	8		274	0	E0	P2YY			
3FFF	ADSORBED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S.	2.3	2.1 8		274	0	E0	P2YY			
3GGG	ADSORBED GAS, TOXIC, OXIDIZING, CORROSIVE, N.O.S.	2.3	5.1 8		274	0	E0	P2YY			
3HHH	BORON TRIFLUORIDE, ADSORBED	2.3	8			0	E0	P2YY			
3JJJ	CHLORINE, ADSORBED	2.3	5.1 8			0	E0	P2YY			
3KKK	SILICON TETRAFLUORIDE, ADSORBED	2.3	8			0	E0	P2YY			
3LLL	ARSINE, ADSORBED	2.3	2.1			0	E0	P2YY			
3MMM	GERMANE, ADSORBED	2.3	2.1			0	E0	P2YY			
3NNN	PHOSPHOROUS PENTAFLUORIDE, ADSORBED	2.3	8			0	E0	P2YY			
3PPP	PHOSPHINE, ADSORBED	2.3	2.1			0	E0	P2YY			
3RRR	HYDROGEN SELENIDE, ADSORBED	2.3	2.1			0	E0	P2YY			

(b) Add the nine new N.O.S entries to Appendix A.

3. Add a new packing instruction P2YY as follows:

P2YY	PACKING INSTRUCTION	P2YY
	This instruction applies to Class 2 adsorbed gases.	
	(1) The following packagings are authorized provided the general packing requirements of 4.1.6.1 are met:  Cylinders specified in Chapter 6.2 and in accordance with ISO 11513:2011 or ISO 9809-1:2010.	
	(2)The pressure of each filled adsorbed gas cylinder shall be less than 101.3 kPa at 20 °C and shall not exceed 300 kPa at 50 °C.	

- (3) The minimum test pressure of the cylinder shall be 21 bar.
- (4) The burst pressure of the cylinder shall not be less than 94.5 bar.
- (5) In no case shall the internal pressure at 65 °C of the filled adsorbed gas cylinder exceed the test pressure of the cylinder.
- (6) The adsorbent material shall be compatible with the cylinder and shall not form harmful or dangerous compounds with the gas to be adsorbed. The gas in combination with the adsorbent material shall not affect or weaken the cylinder or cause a dangerous reaction (e.g. a catalyzing reaction).
- (7) The quality of the adsorbent shall be verified at the time of each fill to assure the pressure and chemical stability requirements of this packing instruction are met each time an adsorbed gas package is offered for transport.
- (8) The adsorbent material shall not meet the criteria of any of the Classes or Divisions in these Regulations.
- (9) Requirements for adsorbed gas cylinders and closures containing toxic gases with an LC<sub>50</sub> less than or equal to 200 ml/m<sup>3</sup> (ppm) shall be as follows:
- a. Valve outlets shall be fitted with pressure retaining gas-tight plugs or caps having threads matching those of the valve outlets.
  - b. Each valve shall either be of the packless type with non-perforated diaphragm, or be of a type which prevents leakage through or past the packing.
  - c. Each adsorbed gas cylinder and closure shall be tested for leakage after filling.
  - d. Each valve shall be capable of withstanding the test pressure of the cylinder and be directly connected to the cylinder by either a tapered thread or other means which meets the requirements of ISO 10692-2:2001.
  - e. Adsorbed gas cylinders and valves shall not be fitted with a pressure relief device.
- (10) Valve outlets for adsorbed gas cylinders containing pyrophoric gases shall be fitted with gas-tight plugs or caps having threads matching those of the valve outlets.
- (11) The filling procedure shall be in accordance with Annex A of ISO 11513:2011.
- (12) The maximum test period for periodic inspections shall be 5 years.
- (14) Special packing provisions that are specific to a substance (see Table 1).

*Material compatibility*

- a: Aluminium alloy cylinders shall not be used.
- d: When steel cylinders are used, only those bearing the "H" mark in accordance with 6.2.2.7.4 (p) are permitted.

*Gas specific provisions*

- r: The filling of this gas shall be limited such that, if complete decomposition occurs, the pressure does not exceed two thirds of the test pressure of the cylinder.

*Material Compatibility for N.O.S Adsorbed Gas Entries*

- z: The special packing provisions relevant to material compatibility in P200 (4) applied to a gas in the compressed or liquefied gas transport condition (in P200 Table 1 or 2) shall apply to that gas in the adsorbed gas transport condition.

The construction materials of the cylinders and their accessories shall be compatible with the contents and shall not react to form harmful or dangerous compounds therewith.

Table 1: ADSORBED GASES

UN No.	Name and description	Class or Division	Subsidiary risk	LC <sub>50</sub> ml/m <sup>3</sup>	Special packing provisions
(1)	(2)	(3)	(4)	(5)	(6)
3XXX	ADSORBED GAS, FLAMMABLE, N.O.S.	2.1			z
3YYY	ADSORBED GAS, N.O.S.	2.2			z
3AAA	ADSORBED GAS, TOXIC, N.O.S.	2.3		≤ 5000	z
3BBB	ADSORBED GAS, OXIDIZING, N.O.S.	2.2	5.1		z
3CCC	ADSORBED GAS, TOXIC, FLAMMABLE, N.O.S.	2.3	2.1	≤ 5000	z
3DDD	ADSORBED GAS, TOXIC, OXIDIZING, N.O.S.	2.3	5.1	≤ 5000	z
3EEE	ADSORBED GAS, TOXIC, CORROSIVE, N.O.S.	2.3	8	≤ 5000	z
3FFF	ADSORBED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S.	2.3	2.1 8	≤ 5000	z
3GGG	ADSORBED GAS, TOXIC, OXIDIZING, CORROSIVE, N.O.S.	2.3	5.1 8	≤ 5000	z
3HHH	BORON TRIFLUORIDE, ADSORBED	2.3	8	387	a
3JJJ	CHLORINE, ADSORBED	2.3	5.1 8	293	a
3KKK	SILICON TETRAFLUORIDE, ADSORBED	2.3	8	450	a
3LLL	ARSINE, ADSORBED	2.3	2.1	20	d
3MMM	GERMANE, ADSORBED	2.3	2.1	620	d, r
3NNN	PHOSPHORUS PENTAFLUORIDE, ADSORBED	2.3	8	190	
3PPP	PHOSPHINE, ADSORBED	2.3	2.1	20	d
3RRR	HYDROGEN SELENIDE, ADSORBED	2.3	2.1	2	

4. Amend 6.2.1.1.5 as follows:

The test pressure of cylinders, tubes, pressure drums and bundles of cylinders shall be in accordance with packing instructions P 200, or, for a chemical under pressure, with packing instruction P206. The test pressure of a closed cryogenic receptacle shall be in accordance with packing instruction P203. The test pressure of a metal hydride storage system shall be in accordance with packing instruction P205. The test pressure of a cylinder for an adsorbed gas shall be in accordance with packing instruction P2YY.

5. Add ISO 11513:2011 and ISO 9809-1:2010 to the list of UN pressure receptacles in sub section 6.2.2.1 in the new sub section 6.2.2.1.6 as follows :

“6.2.2.1.6 The following standards apply for the design, construction and initial inspection and test of UN cylinders for adsorbed gases except that the inspection

requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5.

Reference	Title
ISO 11513:2011	Gas cylinders — Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene) — Design, construction, testing, use and periodic inspection
ISO 9809-1:2010	<u>Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa</u>

6. Amend the list of standards for periodic inspection and test in 6.2.2.4 to include ISO 11513:2011 by adding the standard to the end of the list as follows :

ISO 11513:2011	Gas cylinders — Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene) — Design, construction, testing, use and periodic inspection
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